

microscopists would be likely to go to the trouble of working in invisible light and of passing through a long apprenticeship in mastering the difficulties, apparatus of this description would necessarily be extremely costly, as the whole expense of designing and of constructing special tools would fall on a small number of outfits, or possibly on only a single one. And there would still be the grave drawback that the vast majority of objects would be opaque to extreme ultra-violet rays, and yield only black-and-white outline pictures.

The so-called ultra-microscope does not represent any advance in *resolving* power at all, but most decidedly the reverse. It is highly valuable for the detection of very minute particles and of their movements, which it achieves simply by intense dark-ground illumination, but the structure of the particles remains unrevealed, and only that would amount to an advance in resolving power. The seeing of these minute particles is, in fact, of precisely the same kind as the seeing of stars subtending less than 0.001 second of arc at night with the naked eye, the resolving power of which is of the order of 60 seconds.

PARIS ACADEMY OF SCIENCES.

BONAPARTE AND LOUTREUIL FOUNDATIONS.

OF the 72,500 francs placed at the disposal of the Academy by Prince Bonaparte, it is proposed to allocate 30,000 francs as follows:—

5000 francs to Charles Alluaud, travelling naturalist to the National Natural History Museum, for a geological and botanical expedition in the Moroccan Grand Atlas Chain.

2000 francs to A. Boutaric, for the construction of an apparatus for recording nocturnal radiation.

1000 francs to Emile Brumpt, for continuing his work on parasitic hæmoglobinuria or piroplasmosis of cattle.

3000 francs to E. Fauré-Fremiet, for undertaking a series of studies on histogenesis and certain surgical applications.

3000 francs to A. Guilliermond, for pursuing his researches on lower organisms and on mitochondria.

3000 francs to Joseph Martinet, for continuing his researches on the isatins capable of serving as raw material for the synthesis of indigo colouring matters.

3000 francs to A. Vayssières, for the continuation of his researches of the marine molluscs, family Cypræidæ.

10,000 francs to the Fédération française des Sociétés de Sciences naturelles, for the publication of a fauna of France.

The committee appointed to allocate the Loutreuil foundations recommend the following grants:—

(1) To establishments named by the founder:

10,000 francs to the National Museum of Natural History, for the reorganisation of its library.

7500 francs to the Paris Observatory, at the request of the Central Council of the Observatories, for purchasing an instrument.

(2) Grants applied for direct:

6000 francs to the Société Géologique du Nord, to enable it to take up work interrupted by the war.

10,000 francs to l'Ecole des hautes études industrielles et commerciales de Lille, for restoring the material of its chemical laboratory.

20,000 francs to the Observatory of Ksara (near Beyrout). This laboratory was practically destroyed by the Turks and Germans. The grant is towards its restoration.

8000 francs to Henri Deslandres, for the study of the radial movements of the solar vapours and the thickness of the gaseous atmosphere of the sun.

7500 francs to Maurice Hamy, to carry out certain improvements in astronomical apparatus of precision.

3500 francs to Félix Boquet, for the publication of Kepler tables.

1000 francs to G. Raymond, for the continuation of his actinometric experiments.

10,000 francs to Charles Marie, for exceptional expenses connected with the publication of the "Tables annuelles de constants et données numériques de chimie, de physique et de technologie."

10,000 francs to the Fédération française des Sociétés de Sciences naturelles, for the publication of a French fauna.

2000 francs to P. Lesne, for his researches on the insects of peat-bogs.

2000 francs to A. Paillot, for his researches on the microbial diseases of insects.

2000 francs to Just Aumiot, for the methodical study of the varieties of potato.

5000 francs to Albert Peyron and Gabriel Petit, for the experimental study of cancer in the larger mammals.

3000 francs to Th. Nogier, for completing the installation of the radio-physiological laboratory of the Bacteriological Institute of Lyons.

THE MATHEMATICAL ASSOCIATION.

THE annual meeting of the Mathematical Association was held in the London Day Training College, Southampton Row, on January 7 and 8, under the presidency of Prof. E. T. Whittaker. At the advanced section on the evening of January 7 the president gave a lecture on "A Survey of the Numerical Methods of Solving Equations." He described in some detail "iterative processes" for approximating to the roots and graphical methods of circumscribing the regions on the Argand plane, in which the various roots lay. The Lobachevsky-Graeffe method of approximating to the roots of equations and power series was described in considerable detail. In the animated discussion to which this lecture gave rise it was clearly seen that a wider knowledge of practical computational processes is a desideratum in all branches of mathematical work, which has been practically neglected hitherto in the schools and universities. It was also felt that such practical numerical work was the best possible introduction to the formal study of function theory, many of the ideas underlying which are usually presented in an entirely abstract way, whereas they present themselves naturally and of necessity in less general forms in the science of computation.

Next day, at the general section, Mr. C. Godfrey, of the Royal Naval College, Osborne, surveyed the whole question of the modern teaching of geometry in schools. He strongly favoured a preliminary course of practical instrumental work, to be followed by a more formal course in which "logic" is not too prominent. He advocated the entire postponement of a really rigorous course of abstract geometry until the post-school stage. Prof. T. P. Nunn strongly supported the general tenor of Mr. Godfrey's views, and urged the earlier teaching of "ratio and proportion" as a practical instrument for solving many problems, such as map-drawing, villa construction, etc.

Prof. E. H. Neville, of University College, Reading, next read a paper on "Convention and Duplexity in Elementary Mathematics," in which he protested against the usual "positive-sign" convention with regard to vectors. Miss H. M. Cook dealt with "The Place of Common Logarithms in Mathematical Training," and Prof. W. P. Milne strongly urged

the necessity of making both logarithms and numerical trigonometry compulsory for the university matriculation, because the work of the intermediate classes in the universities was being seriously hampered by the lack of such knowledge on the part of a large number of the students. Prof. Whittaker gave a most interesting paper on "Some Mathematical Problems awaiting Solution," which suggested themselves chiefly in computational work, such as the question of the convergence of certain approximative processes in the case of a large number of simultaneous equations. Mr. R. C. Fawdry opened a discussion on the teaching of mechanics to beginners, and said that, after many years' experience, he still could not decide whether to teach statics or dynamics first. A vigorous protest was entered by Dr. S. Brodetsky, Prof. W. P. Milne, and Mr. A. W. Siddons against the practice that had just arisen of teaching "pure mathematics" in the new advanced courses in secondary schools, thereby promoting undue specialisation at a young age and losing entirely the outlook which a combined course of pure and applied mathematics can supply.

The meetings were extremely well attended and very enthusiastic.

WILLIAM P. MILNE.

INDUSTRIAL RESEARCH ASSOCIATIONS.

THE Department of Scientific and Industrial Research has just issued the following list of research associations which have been approved by the Department as complying with the conditions laid down in the Government scheme for the encouragement of industrial research, and have received licences from the Board of Trade under section 20 of the Companies (Consolidation) Act of 1908:—

British Boot, Shoe, and Allied Trades Research Association, Technical School, Abington Square, Northampton. *Secretary*: Mr. John Blakeman.

British Cotton Industry Research Association, 108 Deansgate, Manchester. *Secretary*: Miss B. Thomas.

British Empire Sugar Research Association, Evelyn House, 62 Oxford Street, London, W.1. *Secretary*: Mr. W. H. Giffard.

British Iron Manufacturers Research Association, Atlantic Chambers, Brazennose Street, Manchester. *Secretary*: Mr. H. S. Knowles.

British Motor and Allied Manufacturers Research Association, 39 St. James's Street, London, S.W.1. *Secretary*: Mr. Horace Wyatt.

British Photographic Research Association, Sicilian House, Southampton Row, London, W.C.1. *Secretary*: Mr. Arthur C. Brookes.

British Portland Cement Research Association, 6 Lloyd's Avenue, London, E.C.3. *Secretary*: Mr. S. G. S. Panisset.

British Research Association for the Woollen and Worsted Industries, Bond Place Chambers, Leeds. *Secretary*: Mr. Arnold Frobisher.

British Scientific Instrument Research Association, 26 Russell Square, W.C.1. *Secretary*: Mr. J. W. Williamson.

British Rubber and Tyre Manufacturers Research Association, c/o Messrs. W. B. Peat and Co., 11 Ironmonger Lane, E.C.2.

The Linen Industry Research Association, 2 Bedford Street, Belfast. *Secretary*: Miss M. K. E. Allen.

Glass Research Association, 7 Seamore Place, W.1. *Secretary*: Mr. E. Quine.

British Cocoa, Chocolate, Sugar Confectionery, and Jam Trades Research Association, 9 Queen Street Place, E.C.4. *Secretary*: Mr. R. M. Leonard.

Schemes for the establishment of research associations in the following industries have reached an advanced state of development:—

Research Associations Approved by the Department but not yet Licensed by the Board of Trade.—British Music Industries Research Association, British Refractory Materials Research Association, British Non-Ferrous Metals Research Association, and Scottish Shale Oil Research Association.

Proposed Research Associations the Memorandum and Articles of Association of which are under Consideration.—British Launderers Research Association, British Electrical and Allied Industries Research Association, and British Aircraft Research Association.

Industrial Organisations Engaged in Preparing Memorandum and Articles of Association.—Silk Manufacturers, Leather Trades, and Master Bakers and Confectioners.

In addition to the industries included above, certain others are engaged in the preliminary consideration of schemes for forming research associations.

THE ORGANISATION OF IMPERIAL STATISTICS.¹

POINTING out that it was almost emphasising the obvious to say that any great nation should be thoroughly informed as to its numerical, its social, and its economic drift, the author directed attention to the fact that this had been recently recognised in a petition to his Majesty's Government so late as November 1 last. It was also emphasised by the calling together of a Conference of the Statisticians of the Empire, under the ægis of the British Government. In view of the position of the British Empire in world affairs, it was but little short of amazing that an Imperial Bureau of Census and Statistics was not long ago established. A bureau, to be really Imperial, must recognise the community of interest of all parts of the Empire. It was not something to be created mainly for the purposes of the United Kingdom, but something which would meet equally well the purposes of each part of the Empire. For this reason the needs of the autonomous Dominions must be quite as carefully considered as those of the United Kingdom itself, and it was implied in the paper that any part of the Empire which could not at present meet the common requirements of the whole must be prepared to do so. The interest would be general only in so far as it was Imperial.

In order to overcome departmental frictions and to secure the sympathy and co-operation of all public departments, it was suggested that a Central Statistical Commission should be created, the president of which would, of course, be the Director of the Bureau of Statistics. Such a Commission would be a body of expert advisers, and could make its departments helpful. The scope of an Imperial Statistical Bureau, both as to administrative procedure and as to subject-matter to be dealt with, was outlined, as was also the question of compilation and publication.

To attempt to organise an Imperial Bureau of Statistics with a small and humbly qualified staff would foredoom it to failure, said the author. In its higher professional section it must necessarily have experts in statistical theory, in the technique of the collection and compilation of statistical data, in pure and applied mathematics, in the languages which are important in the statistical field, in statistical editor-

¹ Abstract of a Paper presented to the Royal Statistical Society on Tuesday, January 20, by G. H. Knibbs, Statistician of the Commonwealth of Australia.